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File No. 9322/36

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P.W DEPARTMENT

E BRANCH (1)

Subject:— Highway Engineering
Post-graduate Course for
Deputation of
engineers to

B [K] 1948

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File No.

9322/36 E (1)

Std. Sect. Slip 24 A

Date.	To whom sent.	Notes and instructions.

ENCLOSURE : I

Copy of letter No. IRC 11(5) dated the 14th April 1947 from the Secretary, Indian Roads Congress, Jamnagar House, Shahjehan road, New Delhi to the Secretariat to the Government of India transport Department, New Delhi.

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Subject :- Highway Engineering - Post-graduate Course
Recommendations of the Education sub-Committee
of the I.R.C.

Reference your letter No. PL-2(73)/45 dated the 29th March 1947.

2. I am directed to enclose an extract from the recommendations of the Education sub-Committee on the subject of post-graduate training in highway Engineering.

3. The Committee have recently further recommended that the Chief Engineers of Provinces should be consulted regarding the administrative feasibility of releasing their serving engineers for a post-graduate course of Highway Engineering. They also recommend that one of the senior members of the road delegation now proceeding to the U.S.A. and U.K. should be briefed to study the current practice in these countries in regard to the stage at which the post-graduate specialisation in Highway Engineering is generally sought by engineers interested in the subject.

4. It is understood that this subject was discussed at the Conference of Chief Engineers which met at Delhi in November 1946 and that their opinion is available in the Transport Department.

5. I am to request that the Transport Department may kindly take further action on the recommendation of the Education Sub-committee that one of the ~~senior~~ senior members of the Delegation should be deputed to study the practice in U.S. A. and U.K. and to make a report.

Extract from the Report of the Education
Sub-Committee of the Indian Roads Congress
dated September 1945 on Post-graduate
Training for Highway Engineers.

II. 5. The Sub-committee is of the view that, generally speaking specialised instruction in Highway Engineering (apart from what is provided in the ordinary Civil Engineering degree courses on the lines suggested in item I above) should take the form of a post-graduate course and should be undertaken after the candidate has obtained a Civil Engineering degree. The Sub-committee realises that this would mean, in the case of Universities which prescribe a 4 years' course of study for a Civil Engineering degree, 5 years' study at the College and this might be too long a period because probably few students would be willing to afford the time and the money. The Sub-committee is, however, of the considered view that every student should have a thorough basic Engineering training initially as specialized training is of little value if the basic training is defective. The post-graduate course would perhaps therefore attract for the post part Engineers already engaged in Highway Engineering.

6. The Sub-committee is of the view that post-graduate courses should normally be of twelve months' duration, 6 months being devoted to theoretical training and 6 months to practical work for graduates who have had no great experience of such work.

7. The Sub-committee would suggest the following syllabus for the post-graduate course :-

- (a) Evolution of the Road.
- (b) Traffic census and the classification of roads.
- (c) General principles of road design.
- (d) Road foundations and Road drainage.
- (e) Principles of waterbound macadam construction.
- (f) General theory of road binders.
- (g) Tar surfacing.
- (h) Asphalt surfacing.
- (i) Concrete roads.
- (j) Other types of modern surfacing.
- (k) Soil mechanics and soil stabilization.
- (l) Road making machinery.
- (m) Quarrying.
- (n) Testing of road aggregates and road binders.
- (o) Road architecture and traffic control.
- (p) Regional planning of highways.
- (q) Statistical method.
- (r) Road administration and the Road Fund
- (s) Economics of road and road transport.
- (t) General principles of road maintenance.
- (u) Geology in relation to road engineering.
- (v) Chemistry in relation to road engineering;
- (w) Bridge Engineering
- (x) Miscellaneous.

8. The Sub-committee consider that the above syllabus can ~~xxxxxxxxxxxxxxxxxxxxxxx160xxxxxxx~~ be covered in about 160 lecture hours. They are also of the view that due weightage should be given to the importance of each subject in apportioning these lecture hours between individual subjects.

9. The Committee considers that as far as possible permanent lecturing staff should handle the post-graduate course in Highway Engineering. Pending, however, the training of suitable personnel in lecturing work, external staff who are specialists, could assist in these courses on a part-time basis.

10. The courses can, with advantage, be arranged in the local Engineering Colleges and later on at Delhi in conjunction with the Road Research Laboratory and the Mitchell Chair of Highway Engineer as soon as these are established.

Copy of notes prepared by an officer of this Ministry of Transport (Roads Organisation).

The memorandum ~~of~~ for the Chief Engineers' Conference as prepared is comprehensive and does not seem to require any further amplification.

2. In this connection as directed by the Ministry of Transport, I had studied the courses of engineering in the representative universities of the United States and the United Kingdom and had discussed with the top ranking engineers and professors in these countries. I had also a discussion with Mr. Thomas H. Macdonald, the Commissioner of Public Roads, United States, Dr. L.I. Hews, Chief of the Western Division of the Public Roads Administration and the author of the book on "American Highway Practice", Mr. Manton who was practically conducting the Chair of Highway Engineering in the Imperial College of Science and Technology on behalf of professor R.H. Clements, Professor of Highway Engineering in the United Kingdom and others.

3. Briefly, the course of studies in Civil Engineering covers four years in most of the American Universities and students are admitted for these courses after completing the School or Matriculation examination. There is no specialised study in highway engineering as such but the broader aspects of highway engineering as part of the civil engineering course are taught such as soil mechanics (elementary), design of pavements, flexible and rigid, structural engineering with special reference to the bridge structures, highway layout, etc. In some universities, some higher studies are made on Soil mechanics but no specialisation is made. In the final two years the students have an option to take one or two major (s) on which they are interested or are electives on any subjects, ~~but they are not advised by the Professors.~~ Highway Engineering as such is not an elective subject, but parts such as Bituminous pavements, concrete pavements, highway layout, traffic surveys, programming and planning etc. are the subgroups and students can take one or ~~two~~ two such groups.

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4. As has been pointed out throughout the file, the general consensus of opinion in both the United States and the United Kingdom seems to be for the students to have basic knowledge of all branches of civil engineering including elementary knowledge of electrical and mechanical engineering. Emphasis is also being given on humanitarian sciences, economics, a second language, a knowledge of contract law and ability to make clear, concise, verbal and written engineering reports, etc.

5. It is considered desirable to have specialised courses on any branch of engineering/AFTER the student has had some years of practical experience in the field and the particular aspects of highway engineering that require specialisation are decided by the candidate or his employers depending on the natural bent of the candidate or the requirements of the employer in any special field. The candidate is then attached to University research work and is closely associated with the Research Professor. The general basic education on all branches of engineering gives a flexibility to the student for seeking employment in any field in which he is able to secure one. This is especially so in India.

6. The Public Roads Administration is training the engineers for their Organisation themselves by a special programme. The objective of the programme is to provide a flow into the Organisation of young graduate engineers trained in the fundamentals of the highway engineering and the philosophy, policy and procedure of Public Roads Administration. This is a continuing programme. A new group of trainees is employed each year so that the flow of trained engineers into the organisation is continuous. This programme had been suspended during the war but has now been revived.. Last year was the second year of operation of the training programme and partly due to the fact that the P.R.A. is in the process of developing procedure schedule and partly due to the limited supply of graduates it has not been possible to induct as many trainees in either the first or second group as could constitute a normal quota. In the first group there were 12 and in the second 18. Ultimately 25 to 30 will be inducted each year and it is considered that this will just compensate for losses due to the retirement, resignation, and death.

7. The training consists of a planned series of work-assignments with correlated study assignments. The sequence and the length of the assignments have been carefully planned to produce the best results. There are five major work assignments as follows

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| 1) Forest & park work | 1 year |
| 2) Physical research laboratory
at Arlington | 6 months |
| 3) Field studies of construction
and operation cost | 6 months |
| 4) Federal-aid work | 6 months |
| 5) Washington office | 8-10 months |

8. During the period the trainees are assembled in the Central office in Washington D.C. for two-week indoctrination period covering study and reading material. After satisfactory completion of the training, the trainees are attached to either the head office or divisional offices in direct charge of any branch of work. Those who specialise in a particular field are given an opportunity to have such works. Periodical reports are called ~~for~~ from the candidates and the officers under whom they work, and any correctives required as administered by the P.R.A. by personal discussion with the candidates. A close study of the aptitudes of the candidates in any special field is made, and this forms the basis for future assignments of types of work to the recruits after their training is completed. During the period of training the salaries are the same as would be paid to the regular employees when freshly recruited, viz. about \$2,640 a year (P1) with annual increments of \$125. After satisfactory completion of training they are promoted to P 2 on \$ 3400 p.a. with annual increment of \$ 125. Retirement is at the age of 62 normally while it is quite usual to retain the services till 70.

9. The recruitment of the trainees is done by the Civil Services Commission after a preliminary examination and a subsequent test by the Public Roads Administration. A liaison officer of the Public Roads Administration visits the various educational institutions throughout the state every year, ascertains from the engineering heads in the universities the probable candidates that would come up to the requirements of the Public Roads

Administration on highway engineering, the candidates are interviewed and every encouragement is given to the students to sit for the Civil Service Examination. In fact due to the dearth of technically qualified men and the larger emoluments paid by private agencies, every attempt is made to steer in through the examination all promising candidates. A similar system is also adopted by the State Highway Commission. As in this country, the Public Roads Administration also recruits for their Organisation promising officers in the several State Highway Departments.

10. I may add a note about the Chair of Highway Engineering ~~that~~ that was instituted in the United Kingdom. I had a discussion with Professor Pippard, the Dean of the Imperial College of Science and Technology, London; Mr. Manton who had been assisting Professor R.H. Clements occupying the Chair of the Highway Engineering; ~~Dean~~ Dean Batson of University of Liverpool; Major Aldington, Chief of the Ministry of Transport; and other officers in the Ministry of Transport, United Kingdom. It was generally felt that the scheme of instituting a Chair in highway engineering worked for only a short time and due to various reasons this has been suspended. There were more students attending this course from outside the United Kingdom than from the country itself. Further, Professor Clements was a practising ~~himself~~ ~~Further, Professor Clements was a practising~~ Engineer of ability and renown and was not a full-time professor attached to the University. Special lectures on technique and methods of construction in highways are now sponsored by the Road Research Laboratory at Harmondsworth where regular training is given to intending candidates. There is no post-graduate study as such in the institutions in U.K.

11. The syllabus prepared by the Indian Roads Congress for post-graduate courses was also discussed with the Professors in America and in the United Kingdom. They were of the opinion that though the syllabus is comprehensive, it could not be completed within 160 hours indicated nor was there need for such an elaborate course on practically every aspect

of highway engineering . A few selected subjects may be grouped depending on the needs of the Organisation for specialisation or h on the capacity of the trainee.

12. All considered, it appears to be unnecessary to have a Highway Engineering course as such in the Civil Engineering education in this country which should ordinarily include general basic education on highway engineering as well though not in a intensified form. The training of young engineers or on specialisation should be on an Organisation system by the various administrations employing them. Research studies can be secured by attaching research institutions when set up. It may be that when our Road Research Institute is in full swing we may be able to organise regular lectures on highway engineering as a training ground for post-graduate students. The syllabus in the Engineering Universities in our country may require some modification but it is probably outside the scope of the present subject to enter into details.

Government of India
MINISTRY OF TRANSPORT : ROADS ORGANISATION:

Dated New Delhi, the 10th March 1948

MEMORANDUM FOR CHIEF ENGINEERS MEETING TO BE
HELD AT ROORKEE, APRIL 1948.

Subject :- POST GRADUATE TRAINING IN HIGHWAY ENGINEERING.

In November 1945 the Indian Roads Congress forwarded a report of one of its sub-committees recommending the establishment of a chair in Highway Engineering in view of the very large programme of post-war road construction contemplated. It was suggested that this chair should be named "The Sir Kenneth Mitchell Chair of Highway Engineering". The idea was to train a professor of outstanding merit in Highway Engineering and the chair was proposed to be attached to the Proposed Road Research Laboratory at Delhi. During the course of discussions since the proposal was first mooted the original idea of establishing a chair on the lines indicated has been lost sight of and instead a scheme for postgraduate training for Highway Engineers has gained ground.

2. The proposal has been discussed at meetings of the All Indian Council for Technical Education and Board of Technical studies in Engineering and Metallurgy. No decision has however, been taken so far. It will be recalled that this question was discussed by the Chief Engineers at their conference held on the 26th of November 1946 prior to the meeting of the Transport/Advisory Council. The general opinion was to the effect that if specialization in Highway Engineering was required it should be deferred until at least the 4th year of a civil engineering course and should run for at least 2 years. Most Provincial Public Works Departments required a degree of flexibility in the Technical equipment of their engineers. Practical training was of the utmost importance and might conceivably take the place of collegiate post-graduate studies. Provinces might have to provide stipends to selected degree holders to enable them to undertake further training. This implied some form of guaranteed appointment on a probationary basis. Overseas training of students was to be encouraged, though it could not entirely take the place

of a thorough training under Indian conditions. The next concrete suggestion in this connection has been received from the Indian Roads Congress. A copy of the Indian Roads Congress letter No. IRC-11(5) dated the 14th April 1947 with its enclosure (Extract from Indian Roads Congress Education Sub-Committee's report) are enclosed. (Encl.I).

3. In April 1946 the Indian Roads Congress was asked to indicate defects in the syllabuses of the Indian Engineering Colleges and to suggest remedies for these and also to indicate to what extent these colleges had neglected to expand educational facilities. The Indian Roads Congress has expressed the view that it is beyond its scope to report how the existing system for the education and practical training of civil engineers in general are defective. The Education Sub-committee of the Indian Roads Congress feels that this could be decided only by a high power committee consisting of representatives from the Indian Roads Congress, the Institution of Engineers(India) and Association of Principals of Technical Institutions.

4. This question was also referred informally to the American experts, General Fleming and Mr. Thomas^a H. Macdonald who visited this country in 1946. Their opinion was that Civil Engineering students should take elementary courses in Mechanical, Electrical and Building engineering, Geology, Physics and Chemistry. They said "We believe that the students in technical institutions should be given a wide base of engineering theory with some knowledge of all (Sic.) its branches as opposed to early specialization in one particular Branch. If, for instance, a student wishes to specialize in highway engineering, we recommend that he spend a year or two after graduation in actual road construction work and then return to college for a post graduate course in his chosen field". They added "It is our opinion that engineering students should carry throughout their under-graduate years certain cultural courses, particularly economics, language, and those designed to give them the ability to make, clear concise, verbal and written engineering reports".

A further comment of these experts was "Engineering

A further comment of these experts was "Engineering for the tyro is not a white-collar profession. Therefore it is well for him to learn at an early date that he will at all times have to get his boots muddy, his hand dirty and, all his fingers nails broken".

5. A copy of the notes prepared by an officer of this Ministry who was briefed to study the current practice in U.S.A. and U.K. is enclosed. (Enclosure II)

6. Chief Engineers' views are invited on the attached report of the Education Sub-Committee of the Indian Roads Congress received with the Indian Roads Congress letter of 14th April 1947. They are also requested to intimate to what extent it would be feasible to release their serving engineers for the post-graduate courses of Highway Engineering. They are also requested to advise on the necessity of the proposed high power committee to advise on engineering education in India.

Id.

(H. Sunder Rao)

Divisional Engineer Consultant.

for Consulting Engineer to the Government of India (Roads)

ENCL: (1) Copy of I.R.C. letter No. IRC 11(5)

dated the 14th April 1947, with

extract from I.R.C. Education Sub-Committee's

Report.

(2) Notes.

To:

All Provincial Chief Engineers concerned with Roads; and the Chief Engineer Central Public Works Department.

The Chief Engineer,
Post-war Reconstruction
(Bombay) Poona

No. 2322/36-E(I).

Public Works Deptt.,
Bombay Castle, 16th August 1948.

To

The Under Secy. to the Govt. of Bombay
Education and Industries Department.

Subject:- Post Graduate Training
in Highway Engineering.

Reference: Your endt. No. 8491/16981-K, dated the 19-6-48, forwarding copy of the Govt. of India, Ministry of Education letter No. F.14-2/46-E-III(P), dated the 1-6-1948.

2. This Deptt. concurs with the views of the Chief Engineers of Provinces that it is unnecy. to include a spl. course of study in Highway Engr. in the curricula of ~~Engt.~~ ^{Engt.} Colleges in India. Engrg. College courses already give a basic training in most subjects necy for an engineer and specialisation will come out of contd. practical experience in works after graduation. Accordingly only the first principles of any subject shd. be taught in the college, and specialisation should start after the Engr. is actually employed in a particular branch of Engrg. so that his studies and practical experience will go side by side. Theoretical studies unaccompanied by practical experience will only be of academic interest and not ~~useful~~ useful in actual practice. Once or twice during the earlier part of the service of an Engr., he should have opportunities to study in some Research Institute, for six months at a time. This will give him the necy. theoretical grounding reqd. in his practical works and will be useful in keeping him abreast of the latest developments in the particular branch he is interested in. It is moreover felt that Engrs. do not study the economics of diff. types of road surfaces under diff. conditions (e.g. lead of metal) and are prone to be led or rather misled; by advertisements of costly surface materials. This cannot be cured by spl. courses of study. The problem must be studied first by unprejudiced Engrs. and these results circulated for the information of others.

Copy to the Secretary , All India Council for
Technical Education, Govt. of India, Ministry of Education,
for information.

Id .

14-8-48